

Practical guide: 3D printed jigs and fixtures

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At a glance: the guide in brief

The idea	A tool adapted to the operator's movements makes positioning, assembly and inspection more reliable.
Where to start	A repetitive operation that is easy to observe and not critical for safety.
Why 3D printing	No mold, custom design, quick corrections after trials, reusable digital model.
The material	Choose it for the real environment (temperature, stiffness, abrasion, humidity, chemicals), not for being "the strongest".
The design	Function first, print orientation, hybrid reinforcement in critical areas, validation of the first unit.
The limits	Creep, wear, very high loads, safety or metrology requirements: a metal or hybrid tool may be preferable.
The payback	Compare the full cost with the gain measured at the workstation, before and after the prototype.

Innovation in a factory is not always a new machine. Sometimes it is simply a tool adapted to the operator's movements.

In a workshop, a few seconds lost positioning a part, an unstable setup or an inspection that is hard to repeat can become real production problems. Yet the need does not always justify designing and machining custom metal tooling.

3D printed jigs, fixtures and manufacturing aids offer another approach: design a plastic solution adapted to the workstation, try it quickly, then improve it through real use. The benefit is not only the price of the tool. It lies in fewer manipulations, better repeatability and ease of adaptation when the product changes.

The hidden problem of workshops: everything around the part

When a company wants to improve productivity, it often thinks first of a new machine, automation or software. But time is lost well before and after the main operation: positioning a housing, holding a part during assembly, checking a hole spacing, orienting a component or arranging items in the right order.

An experienced operator can compensate for these difficulties. The process becomes less repeatable, however, when a new colleague joins the team or a series changes reference.

A simple tool, designed for one precise operation, can make the right movement more natural. It does not replace know-how: it helps make it **reproducible**.

Jig, fixture, gauge: what are we talking about?

Tool	Main function	Example of use
Positioning jig	Show where to place a part or an element	Repeatably position a label or a connector
Holding fixture	Stabilize a part during an operation	Hold a housing during an assembly step
Operation guide	Guide an operation according to defined references	Guide a repetitive operation, with reinforced wear zones if needed
Inspection gauge	Check a defined characteristic	Quickly check whether a geometry passes or not
Preparation tray	Present components in an orderly way	Prepare an assembly kit and reduce part mix-ups

These categories sometimes overlap. What matters is to define exactly **the action the tool must make reliable**. For several years, Stratasys and UltiMaker have described industrial uses ranging from holding and alignment to inspection devices and ergonomic aids [1], [2].

Why is 3D printing relevant for these tools?

Manufacturing without dedicated tooling

A plastic jig made by fused filament deposition (FDM/FFF) can be produced directly from a 3D model, without an injection mold. This is particularly useful for a single copy, a small series, a pre-series or a workstation that changes regularly.

A design adapted to the real movement

The geometry can match the shape of the part to be held. Visual markers, component seats, a grip or contact zones can be built in from the design stage.

Quick corrections after trials

The first tool is not necessarily the last. After use at the workstation, it may be worth changing the height of a stop, enlarging a clearance, changing a handle or separating a wear zone into a replaceable element. With a well-organized CAD file, these changes become much simpler.

A reusable digital model

The tool can be archived with its reference, version, material and inspection criteria. When it wears out or another workshop needs it, the data makes it possible to prepare a new copy without starting from scratch.

Four practical applications for an industrial SME in Algeria

1. Electronics and housing assembly. A plastic fixture can hold a housing in a stable orientation and leave access to its fastening points. It can also include seats for small parts and limit mix-ups during assembly. For exposed electronic boards, electrostatic (ESD) requirements must be examined: a standard FDM plastic is not automatically dissipative [2], [6].

2. Packaging and labeling. A positioning jig can help place a label, an identification plate or an accessory consistently on packages and products. It is an accessible starting point, with generally low loads and an easily observed result.

3. Maintenance and small mechanical series. A suitable fixture can stabilize a cover, a casing or a small non-critical part during an inspection or assembly operation. Where some surfaces are heavily stressed, the solution can become hybrid: a plastic structure with standard metal components only where needed.

4. Quick dimensional inspection. A gauge can allow an operator to sort parts according to a precise functional criterion. It does not replace a calibrated measuring instrument or a suitable metrology procedure. Its value is in turning a repetitive check, once validated, into a simple and consistent operation.

These applications may interest packaging, electronics, maintenance and industrial equipment companies in Algeria. **These are possible use cases, not projects attributed to ON3D Lab**.

A documented industrial example: Valeo and the inspection of an automotive part

According to Stratasys, Valeo inspected an automotive tube using a **"go / no-go" gauge printed in ASA**. Inspection went from **25 minutes to 20 seconds per tube**, a **98.7% time reduction**. Making the gauge took **2 weeks, versus 12** for the machined alternative [3].

These results concern one particular case, not a performance promise from ON3D Lab. The lesson is to assess the time saved on the operation, and not only the material cost of the tooling.

What makes a good FDM jig: five technical decisions

1. Design around the function, not only the shape

Before modeling, you need to know the important geometric references, the loads, the expected number of cycles, the operating environment and how the operator handles the tool. A part that "fits" does not by itself guarantee repeatable positioning.

2. Take the print orientation into account

An FDM part is built in layers. Its mechanical behavior can depend on the build orientation; loads that stress layer adhesion unfavorably call for particular attention. The orientation must therefore be chosen according to the loads and the functional surfaces, not only to minimize print time [4].

3. Select the polymer for the real environment

The choice is not limited to the material reputed to be "the strongest". Temperature, stiffness, vibration, abrasion, humidity, chemical exposure and duration of loading must be examined.

Possible material	Suggested use for tooling	Main point of caution
PETG	Assembly aids and moderately stressed fixtures	Deformation under prolonged load and heat
ABS / PC-ABS	Functional tooling in indoor environments	Print quality, impact, temperature and chemistry to be checked
ASA	Tooling that may be exposed to outdoor light	Mechanical and dimensional validation required
PA (nylon)	Parts subject to friction or repeated loads, depending on formulation	Humidity, dimensional stability and manufacturing conditions
PC	Some fixtures requiring more stiffness or heat resistance	Process requirements and validation of the geometry
TPU	Contact pads, surface protection and soft interfaces	Dimensional hold under load; chemical resistance depends on grade

This table is meant to **guide the feasibility study**, not to qualify a material for all applications. The datasheet of the grade actually used, the design and the tests remain decisive. The manufacturers' application guides support this function-based approach [1], [2].

4. Reinforce only the critical zones

The main structure can remain 3D printed plastic while standard components — threaded inserts, bushings, pins or fasteners — provide the functions that need better wear resistance or frequent disassembly. This does not mean a 3D printing workshop must make metal: it is a **hybrid design** combining a custom plastic geometry with commercially available components [1], [6].

5. Validate the first unit before repetitive use

The inspection must cover functional dimensions, stability, clearances, ergonomics, repeated loading and the absence of damage to the handled parts. For sensitive functions, a documented validation protocol is essential.

The standard **ISO/ASTM 52920:2023** defines requirements for the qualification and quality control of industrial additive manufacturing processes and sites. It can serve as a reference for structuring a production approach, although reading its summary is not enough to claim compliance [5].

The forgotten risk: a plastic can change during use

A jig that is well sized on delivery can change behavior after weeks of continuous loads, heat or repeated handling. Polymers can show **creep** under sustained load; contact areas can wear and some fastenings can loosen. Formlabs' recommendations draw attention in particular to sustained loads and heavily stressed surfaces. They concern **SLA resin parts**: they help identify points of caution, but do not qualify the performance of an FDM material [6].

A printed tool is therefore not necessarily the right choice for holding under very high loads, excessive temperature, a high safety requirement or a metrological accuracy that cannot be checked and maintained. In those cases, metal tooling, a hybrid solution or a different manufacturing process may be preferable.

How to calculate whether the tooling is profitable?

The right indicator is not only the manufacturing price. You need to compare the **full cost** with the benefit at the workstation.

Full cost of the tooling: study and modeling + manufacturing + standard components + validation tests + maintenance and possible replacements.

Possible benefits: shorter cycle time + avoided rework + avoided positioning errors + less waiting for tooling + easier adaptation to reference changes.

To make the decision objective, an SME can record the average time of an operation **before and after** a prototype is introduced, over a representative number of cycles, then examine the defects and touch-ups. The net gain must be calculated from these real observations, without assuming a percentage of savings in advance.

A jig that costs little but slows the operator down is a bad investment. Conversely, slightly more elaborate custom tooling can be worthwhile if it makes a high-repetition workstation more reliable.

A simple method to launch a first project

The best starting point is not the most complex part in the factory. It is **a repetitive operation that is easy to observe and not critical for safety**.

1. **Identify the irritant:** where is time lost? Which movement varies from one operator to another?
2. **Define the success criteria:** positioning, effort, rate, risk of marking, functional dimensions.
3. **Design and produce a plastic prototype:** favor a simple, removable or modifiable solution.
4. **Have real use validated:** get feedback from the operator and from the methods/quality manager.
5. **Freeze the right version:** document the CAD model, material, useful parameters and inspection results.

This method applies just as well to a maintenance workshop in Oran as to an assembly line, a packaging manufacturer or an electronics SME elsewhere in Algeria.

Conclusion: sometimes, the best optimization is a small plastic part

Industrial 3D printing does not need to replace a production line to be useful. It can simply provide **the missing tool between the machine, the part and the operator**.

Positioning jigs, assembly fixtures, preparation trays and inspection gauges are all projects where customization and speed of modification can make the difference. The condition is to treat each tool as a real production component: with requirements, an appropriate material and a validation proportionate to the risks.

At ON3D Lab, we support the study and manufacturing of custom plastic parts and tooling for prototyping and production needs. Do you have a repetitive operation that is hard to make reliable? A photo of the workstation, a sketch or a description of the constraints can be a good starting point for examining the feasibility of a suitable jig.

Present your tooling need to ON3D Lab

Quick glossary

Jig	Tool that shows or checks where a part or an element must be placed.
Fixture (holding fixture)	Device that stabilizes a part during an operation, such as assembly or inspection.
Go / no-go gauge	Quick inspection tool: the checked geometry either passes or does not.
FDM / FFF	3D printing by fused filament deposition, layer after layer.
Creep	Slow deformation of a plastic under a sustained load.
ESD	Electrostatic discharge: a requirement to examine for exposed electronic boards.
Hybrid design	Custom plastic structure combined with standard components (inserts, bushings, pins) in critical areas.

An operation that is hard to make reliable?

Send a photo of the workstation, a sketch or a description of the constraints: we will examine the feasibility of a suitable jig or fixture.

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Technical sources and documented cases

[1] Stratasys — FDM Jigs, Fixtures and Manufacturing Tools, industrial applications guide.

[2] UltiMaker — 3D printing jigs and fixtures: Revolutionizing manufacturing efficiency, July 21, 2025.

[3] Stratasys — Valeo Streamlines Quality Inspection with 3D Printed Fixtures, manufacturer case study (performance specific to this case).

[4] Stratasys — Additive Manufacturing Simulation for FDM Parts, June 30, 2026. Orientation, deposition paths and mechanical behavior.

[5] ISO — ISO/ASTM 52920:2023: requirements for industrial additive manufacturing processes and sites, published June 2023.

[6] Formlabs — Jigs, fixtures, and manufacturing aids, recommendations for SLA resin tooling; not a qualification of FDM materials.